## Understanding the issue:

Global temperature data and various cities' temperature data have been given. The issue is to find out Weather trend over a long period of time and to compare the trend with local trend. I live in Atlanta city. I have chosen this city to compare with the global temperature data.

## Plan for analysis:

I will use **"Moving Average "** (MA) instead of average temperature. Because it will catch the yearly trends but will not be too focused on the yearly trends. Three moving averages (MA) will be used: 10-year MA, 15-year MA and 20-year MA.

At first, I will run a SQL query to get all the necessary columns and paste into an EXCEL file. Then I will create line charts for each moving average and finally we will compare the moving average trends between global temperature and Atlanta city.

## The Database Schema

There are three tables in the database:

- city_list - This contains a list of cities and countries in the database. Look through them in order to find the city nearest to you.
- city_data - This contains the average temperatures for each city by year (ºC).
- global_data - This contains the average global temperatures by year (ºC).

## Procedure:

- **Extracting the data:**
  1. At first, I imported all the csv files into SQL Server Management Studio 2018.
  2. Then I ran a query to get a table containing all the necessary columns. These columns are city, year, avg_temp (average temperature of city), avg_temp (average temperature of global data). I have joined city_data and global_data based on year data.
  3. Then I copied the data with headers and pasted in excel.

```sql
SELECT city_data.city AS "City Name",
city_data.year AS "Year",
city_data.avg_temp AS "City Average Temp.",
global_data.avg_temp AS "Global Average Temp."
FROM city_data
JOIN global_data
ON city_data.year = global_data.year
WHERE city_data.city='Atlanta'
ORDER BY global_data.year
```

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⊞ Results   📄 Messages

| | City Name | Year | City Average Temp. | Global Average Temp. |
|---|---|---|---|---|
| 1 | Atlanta | 1750 | 15.01 | 8.72 |
| 2 | Atlanta | 1751 | 15.73 | 7.98 |
| 3 | Atlanta | 1752 | 9.22 | 5.78 |
| 4 | Atlanta | 1753 | 14.42 | 8.39 |
| 5 | Atlanta | 1754 | 14.53 | 8.47 |
| 6 | Atlanta | 1755 | 12.28 | 8.36 |
| 7 | Atlanta | 1756 | 14.63 | 8.85 |
| 8 | Atlanta | 1757 | 14.11 | 9.02 |
| 9 | Atlanta | 1758 | 12.96 | 6.74 |
| 10 | Atlanta | 1759 | 13.97 | 7.99 |
| 11 | Atlanta | 1760 | 12.59 | 7.19 |

✅ Query executed successfully.

- **Creating moving average columns:**
  1. The formula is (for 10-year moving average) =AVERAGE(B2:B11)
  2. For both global and Atlanta city, I created six new columns for 10, 15 and 20 year MA.

- **Descriptions of line charts:**
  1. I have created 3 line charts: 10-year moving average, 15-year moving average and 20-year moving average.
  2. In these charts, I compared moving average(MA) temperature  between global and Atlanta city from year 1750 to year 2013.
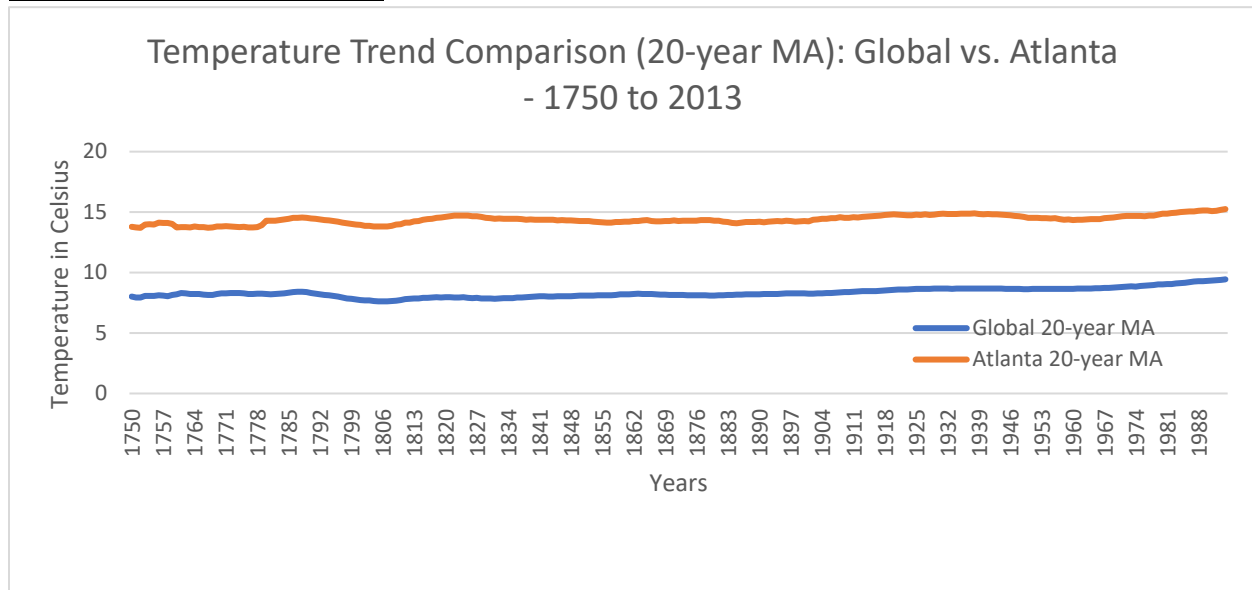
## 10-year MA comparison:



## 15-year MA comparison:
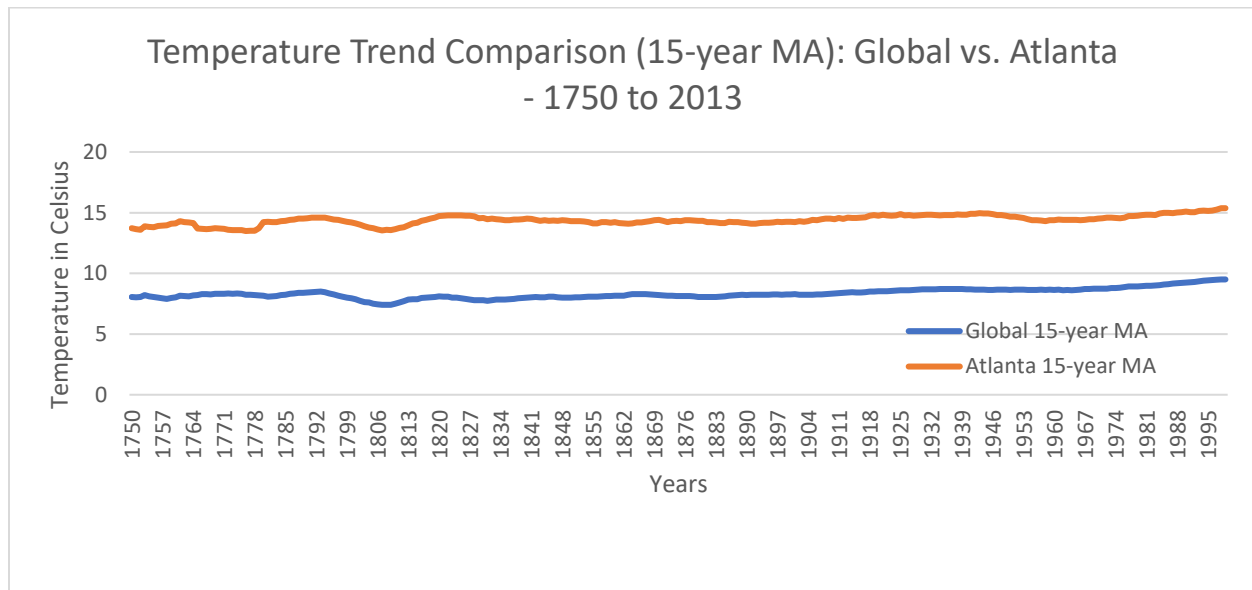
## Temperature Trend Comparison (20-year MA): Global vs. Atlanta - 1750 to 2013
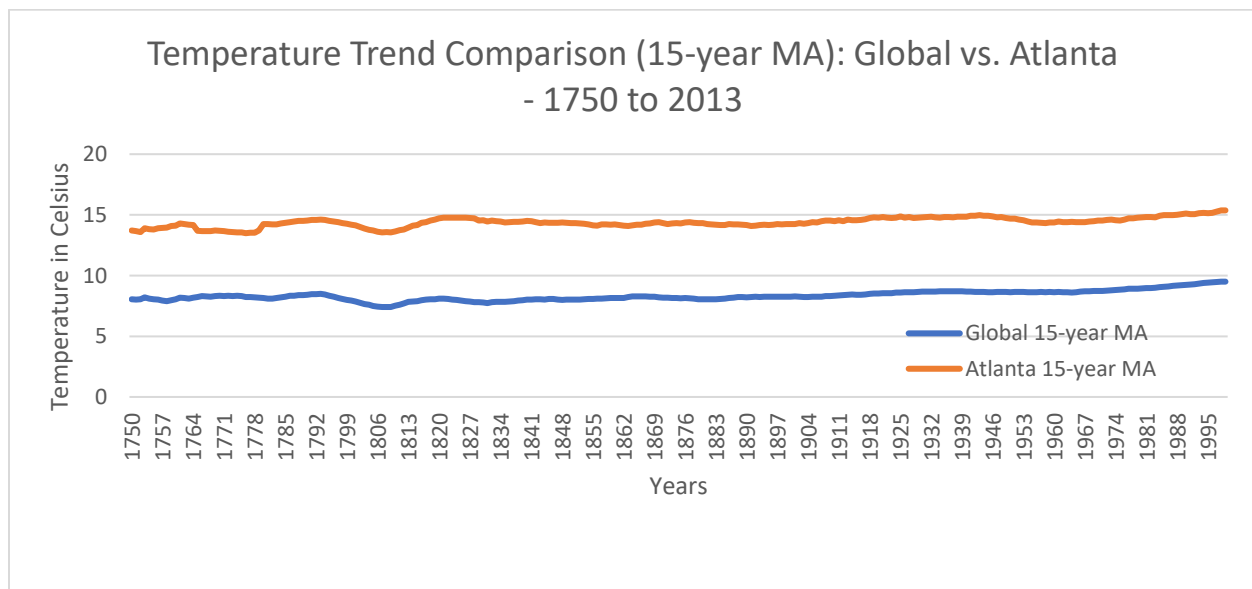


## Observations:

1. The difference of moving average temperature between global and Atlanta city is consistent over the time.
2. In year 1750, the global temperature was 8.72 Celsius and Atlanta temperature was 15.01 Celsius. But in the year 2013, global and Atlanta temperature was 9.61 and 16.14 Celsius. Clearly, there is an upward trend, all the line charts testify that.
3. The difference between local (Atlanta city) and global MA temperature is fairly consistent, the difference is about 7 degree Celsius.
4. But, sometimes, there are some inconsistences. For example, if we look at the 10-year MA comparison line chart, we can clearly see, in the years between 1771 and 1778, the local temperature was decreasing but the global temperature was increasing.
5. Overall, line charts start to become smoother if we move through 10-year MA to 15-year MA and then to 20-year.

## Decisions:

1. It is clear the temperature is increasing over time.
2. Local temperature is also rising aligning with the global temperature and there is consistency between this too.

## Further research:

1. We can compare other city's weather trend with global trend. This will help to strengthen the argument.